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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/565,773

08/17/2006

Otto Erik Sielcken

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EXAMINER

CUTLIFF, YATE KAI RENE

ART UNIT

PAPER NUMBER

1621

MAIL DATE

DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/565,773	<b>Applicant(s)</b> SIELCKEN ET AL.	
	<b>Examiner</b> YATE' K. CUTLIFF	<b>Art Unit</b> 1621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 27 August 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-9, 12 - 15 & 17 - 21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9, 12 - 15 & 17 - 21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |                                                                                     |                                                                   |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                    | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____                                                         | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Status of Claims***

1. Claims 1 – 9, 12 – 15 and 17 - 21 are pending.  
Claims 10, 11 & 16 have been canceled  
Claims 1 – 9, 12 – 15 and 17 - 21 are rejected.

### ***Response to Amendment***

2. The amendment to claims 1 and 9, submitted August 27, 2009 is acknowledged and entered.

### ***Response to Arguments***

3. Applicant's arguments, see page 6, filed August 27, 2009, with respect to the 35 USC 112, second paragraph rejection of claims 1 and 20 have been fully considered and are persuasive in view of the amendment to the claims. The 35 USC 112, second paragraph rejection of claims 1 and 20 has been withdrawn.
4. Applicant's arguments, see pages 7 - 9, filed August 27, 2009, with respect to the rejection(s) of claim(s) 1 – 9, 12 – 15 and 17 - 21 under 35 USC 103(a) have been fully considered and are persuasive, in part, in view of the amendment to claim 1 and the arguments.. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Drent et al. (US 6,737,542), Drent et al. (US 5,304,764), Drent ( WO 02/26690) and Sielcken et al. (US 5,495,041).

### ***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 2, 6, 7 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. Claims 2, 6, 7 and 8 each reference either, "the ligand make-up" or "said ligand make-up". However, since claim 1 identifies the process ligand (b) as ligand make-up and a second phosphine ligand as ligand make-up it is not clear whether one or both the process ligand and second ligand are being used as the make-up ligand.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

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were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claim 1 – 9, 12 – 15 and 17 – 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drent et al. (US 6,737,542) (Drent 3), Drent et al. (US 5,304,674) (Drent 2), Drent (WO 02/26690) (Drent 1) and Sielcken et al. (Us 5,495,041).

12. The rejected claims cover, inter alia, a process for the carbonylation of a conjugated diene comprising: reacting a conjugated diene with carbon monoxide and a hydroxyl group-containing compound in the presence of a palladium catalyst system in a reaction zone to produce a reaction mixture, said catalyst system comprising (a) a source of palladium cations, (b) a phosphine process ligand as defined; (c) a source of anions containing a carboxylic acid, wherein the process ligand (b) is fed continuously or periodically into the process as ligand make-up at a temperature of 50°C or lower, and wherein the process further comprises feeding a second phosphine ligand different from the process ligand (b) continuously or periodically to the process as ligand make-up, wherein said second phosphine ligand contains at least one phosphorous atom which is connected to two aryl groups and is chosen such that its phosphonium salt is reversible under carbonylation conditions.

The dependent claims further modify the process steps; limit the second phosphine ligand; and identify the reactants as specific conjugate diene, hydroxy groups and carboxylic acids.

13. Drent 3 teaches at column 1, lines 49-65 the following process:

The present invention therefore provides a process for the carbonylation of conjugated dienes, whereby a conjugated diene is reacted with carbon monoxide and a hydroxyl group containing compound in the presence of a catalyst system based on:

- (a) a source of palladium cations,
- (b) a phosphorus-containing ligand
- (c) a source of anions, wherein the phosphorus-containing ligand is a ligand having the general formula I



wherein  $X^1$  and  $X^2$  represent a substituted or non-substituted cyclic group with at least 5 ring atoms, of which one is a phosphorus atom, and R represents a bivalent organic bridging group, connecting both phosphorus atoms, containing from 1 to 4 atoms in the bridge.

The process prepares alkyl pentenoates and/or adipates from 1,3-butadiene. (see col. 1, lines 9-10). The sources of hydroxyl are alkanols with 1-20 carbon atoms, where suitable alkanols are methanol and ethanol. (see col. 2, lines 41-51). Suitable sources of phosphorous-containing ligands are formula (I) substituted or non-substituted and mixtures thereof, as set out in column 4, lines 34-43. Additionally, suitable substituents for the phosphabicyclononyl rings ( $X^1$  and  $X^2$ ) are set out in col. 4, lines 1-27. The source of anions for step (c) are carboxylic acids i.e. pentenoic acid. (see col. 5, lines 13 & line 59). Solvents useful in the process include diethyleneglycol. (see col.

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7, lines 23-25). The reaction temperature ranges from 20 to 200°C. (see col. 7, lines 27 – 28). Further, the process can be continuous. (see col. 6, lines 57 – 58). Lastly, the process is selective for either mono-ester or diester; and can be partially regulated by the source of anions used and regulated by the residence time in the reaction vessel. (see col. 5, lines 53-54 & 63-67).

14. The difference between the claimed process and Drent 3 is as follows: a second phosphine ligand different from process ligand (b) wherein the second phosphine ligand contains at least one phosphorous atom connected to two aryl groups; the process ligand (b) and second phosphine ligand as ligand make-up; monitoring the concentration and degradation rate of the process ligand; adding the second phosphine ligand in an amount sufficient to make-up the consumption of the process ligand (b); separation of the reaction product from the reaction mixture to obtain the catalyst mixture and recycling the catalyst mixture; the make-up ligand is added to the catalyst mixture prior to feeding to the reaction zone; the phosphonium salt of the second ligand is reversible under carbonylation conditions; and the second phosphine ligand has less coordination strength to palladium.

15. However, with regard to the use of a second phosphine ligand that is different, and one with at least one phosphorous atom connected to two aryl groups, the Examiner turns to the teaching of Drent 2 where the carbonylation process set out in Example 2 uses 1,4-bis(diphenylphosphino)butane (bis(diarylphosphino) alkane) with 1,3-bis(c-octylenephosphino)propane (isomeric mixture comprising 1,2- and 1,5-cyclooctylene groups). (see col. 6, Table). The Drent 2 reference suggest the use of

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two different ligand sources in the carbonylation of a conjugated diene, where one is a ligand that has at least one phosphorous atom connected to two aryl groups and the other ligand is multidentate phosphine ligand bonded to two aliphatic carbon atoms. Even though Drent 2 does not specifically teach the use of the process ligands of Applicant's claimed process, those process ligands are like those of Drent 2, known to be useful in the carbonylation of conjugated diene.

In light of the fact that Drent 3 and Drent 2 both use known phosphine process ligands that are successful in the carbonylation of a conjugated diene, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to substitute the one of the ligands of formula I of Drent 3 with a 1,4-bis(diphenylphosphino)butane (bis(diarylphosphino) alkane) because from the teaching of Drent 2, it was known that they could be used in mixtures with other bidentate phosphine ligands effectively in producing the desired carbonylation products.

As such, in light of the forgoing discussion, the Examiner concludes that the subject matter defined by the instant claims would have been obvious within the meaning of 35 USC 103(a). From the teachings of the references, it is apparent that one of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common senses. In this instance the fact that a combination was obvious to try might show that it was obvious under §103, KSR, 550 U.S. at \_\_\_, 82 USPQ2d at 1397.



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16. With regard to the use of the process ligand (b) and second phosphine ligand as ligand make-up and monitoring ligand consumption, the Examiner turns to the teaching of Drent 1. In the carbonylation process of this reference, that uses phosphine ligands with cyclic groups like Drent 3 (see page 5, lines 21-34); Drent 1 teaches that degradation of phosphine ligand is decreased or does not occur when excess ligand is included in the process. (see page 14, lines 16 – 20). Preferably, during the course of the reaction process the concentration of the ligand, for degradation, is monitored, with fresh ligand being added in order to ensure that the ligand remains within the preferred ranges for operation of the reaction. (see page 14, lines 21 – 28). Drent 1, does not make specific reference to the use of the fresh ligand as make-up, however, it can be termed make-up because it is added to the carbonylation reaction based upon the consumption of the process ligand determined by monitoring the ligand concentration as the reaction proceeds.

17. With regards to adding the second phosphine ligand in an amount sufficient to make-up the consumption of the process ligand (b), the Examiner turns to the teaching of Drent 1, where fresh ligand is added based upon consumption of the process ligand. Drent 1 does not specifically teach the use of the fresh ligand being a different ligand; however, in a continuous system such as the one disclosed in Drent 2, it would be within the purview of one skilled in the art to use anyone of the ligands as added fresh (make-up) ligand as the process ligand in the catalyst system degraded. (see page 14, lines 22-28). Thus, this limitation is deemed to be obvious absent a showing of unexpected results.

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A reference is good not only for what it teaches by direct anticipation but also for what one of ordinary skill in the art might reasonably infer from the teachings. (*In re Opprecht* 12 USPQ 2d 1235, 1236 (Fed Cir. 1989); *In re Bode* 193 USPQ 12 (CCPA) 1976). In light of the forgoing discussion, the Examiner concludes that the subject matter defined by the instant claims would have been obvious within the meaning of 35 USC 103(a). From the teachings of the references, it is apparent that one of ordinary skill in the art would have had a reasonable expectation of success in producing the claimed invention. Therefore, the invention as a whole was *prima facie* obvious to one of ordinary skill in the art at the time the invention was made, as evidenced by the references, especially in the absence of evidence to the contrary.

18. With regard to the separation of the reaction product from the reaction mixture and recycling the reaction mixture with a portion of the catalyst mixture, Drent 3 discloses that liquid carbonylation product and/or surplus of a carbonylation reactant may serve as solvent during the reaction. (see col. 7, lines 18 – 21). Drent 3 does not specifically state that the any remaining portion of the catalyst system is removed. Further from the teaching of Drent 1, fresh ligand is added in the reaction process because of ligand degradation. As such, in a continuous process, one skilled in the art would expect that a portion of the ligand would be in that portion of the liquid carbonylation product and/or surplus of the carbonylation reactant that was returned to the system as solvent during the reaction. It is well established that consideration of a reference is not limited to the preferred embodiment or working examples, but extends to the entire disclosure for what it fairly teaches, when viewed in light of the admitted

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knowledge in the art, to person of ordinary skill in the art. (in re Boe, 355 F.2d 961, 148 USPQ 507, 510 (CCPA 1966); In re Lamberti, 545 F.2d 747, 750, 192 USPQ 279, 280 (CCPA 1976); In re Fracalossi, 681 F.2d 792, 794, 215 USPQ 569, 570 (CCPA 1982); In re Kaslow, 707, F.2d 1366, 1374, 217 USPQ 1089, 1095 (Fed. Cir. 1983)).

19. With regard to the make-up ligand being added to the catalyst mixture prior to feeding to the reaction zone, the Examiner turns to the teaching of Sielcken et al. which discloses that multidentate and monodentate phosphine ligands can be simultaneously present (added at the same time) during carbonylation. (see col. 5, lines 7-8).

Applicant's claimed process uses bidentate (step (b) ligands) and monodentate phosphine ligands (triaryl phosphine). Thus, because in this claimed process step applicant is adding bidentate (multidentate) and monodentate phosphine ligands at the same time prior to feeding to the reaction zone, this limitation is deemed to be obvious absent a showing of unexpected results.

A reference is good not only for what it teaches by direct anticipation but also for what one of ordinary skill in the art might reasonably infer from the teachings. (*In re Opprecht* 12 USPQ 2d 1235, 1236 (Fed Cir. 1989); *In re Bode* 193 USPQ 12 (CCPA 1976). In light of the forgoing discussion, the Examiner concludes that the subject matter defined by the instant claims would have been obvious within the meaning of 35USC 103(a).

20. With regard to the phosphonium salt of the second ligand being reversible (regenerated) under carbonylation conditions; and that the second phosphine ligand has less coordination strength to palladium, based on the fact that the combination of

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references Drent 3, Drent 2, Drent 1 and Sielcken et al. each teach the use of the claimed phosphine ligands in the carbonylation of a conjugated diene; the skilled artisan would reasonably conclude that these ligands necessarily exhibit the claimed properties. "Products of identical chemical composition can not have mutually exclusive properties." A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

A reference is good not only for what it teaches by direct anticipation but also for what one of ordinary skill in the art might reasonably infer from the teachings. (*In re Opprecht* 12 USPQ 2d 1235, 1236 (Fed Cir. 1989); *In re Bode* 193 USPQ 12 (CCPA) 1976). In light of the forgoing discussion, the Examiner concludes that the subject matter defined by the instant claims would have been obvious within the meaning of 35USC 103(a). From the teachings of the references, it is apparent that one of ordinary skill in the art would have had a reasonable expectation of success in producing the claimed invention. Therefore, the invention as a whole was *prima facie* obvious to one of ordinary skill in the art at the time the invention was made, as evidenced by the references, especially in the absence of evidence to the contrary.

### **Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YATE' K. CUTLIFF whose telephone number is (571)272-9067. The examiner can normally be reached on M-TH 8:30 a.m. - 5:00 p.m..

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel M. Sullivan can be reached on (571) 272 - 0779. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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